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ABSTRACT

The usefulness of cost-benefit analysis in evaluating programs to reduce illiteracy is considered, and the advantages and limitations of this approach are illustrated by citing results from studies concerning the returns to investment in education. The discussion of cost-benefit analysis is based primarily on the assumption that the value of consumption in the society, given a certain distribution of income, is the goal of society. Other goals that society might wish to implement through government literacy programs are: (1) to redistribute income among certain racial groups, certain age groups, or regional areas; (2) to stimulate economic growth and guarantee a self-sufficient economy; and (3) to help correct its balance of payments problems. Methods of implementing these side goals are discussed. Rates of return to literacy and primary education are illustrated by results of studies conducted in India, Latin America, and the United States. Cost-benefit analysis in adult literacy programs provides the decision maker with a useful tool with which to make more rational choices in the allocation of funds to education. (DB)

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COST-BENEFIT ANALYSIS IN ADULT LITERACY PROGRAMMES

by

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Introduction

This paper should not be considered as a complete critique of cost-benefit analysis in general or as a complete review of the literature on returns to investments in education. Instead, the purpose is to consider the usefulness of cost-benefit analysis in evaluating programmes to reduce illiteracy, and to illustrate the advantages and limitations of this approach by citing results from studies concerning the returns to investment in education.

Public policy-makers at various levels are faced with decisions concerning the amount of resources that they should devote to different educational programmes. Since almost all programmes that the policy-maker might consider are likely to generate some social benefits, and since resources are limited, the policy-maker must decide which programmes contribute the most benefits to society for the scarce resources used. The rôle of cost-benefit analysis is to aid in this necessary matter of choice. Of course, without a complete specification of the social welfare function for the society, it is not probable that one will discover a unique ordering of investment priorities. The traditional approach to this problem by economists has been to attempt to simulate a perfectly competitive situation in determining public investment priorities. While it is true that under rather strict assumptions, a competitive economy will allow the determination of an optimal set of private investment priorities, there is no reason to believe that society should use market criteria for allocating resources or that the market can be simulated by the public decision-maker. A perfectly competitive market, given all the necessary qualifications, will allocate resources so as to maximize the value of consumption for a given distribution of income. But society may be interested in using public investments to redistribute income among groups or regions, to stimulate economic growth, or to guarantee economic independence. In this case, the market solution may no longer be satisfactory.

Before undertaking a diagnosis of the defects of cost-benefit analysis, and possible remedies for these defects, let us consider the practical value of the analysis for those interested in evaluating adult literacy programmes: the development functionary, educationalists, bankers, economists, general policy-makers, and the people of the country in general. Assuming that the appropriate market information is available, or some proxy for market values can be had, the analyst can, to a limited extent, show the value of the programme in contributing to the net consumption value for the entire population. In addition, it is also often possible to show who the beneficiaries will be under current institutional arrangements and who will pay the costs[1]. In general, the analysis will provide a number of costs and benefits that are quantifiable, and others that will be listed as mere pluses and minuses or rather crude guesses as to the magnitude of the effect.

The above information, when presented in a rather detailed manner, will often uncover costs or benefits that would not have been considered in a less rigorous approach. Often the programme would not be justified merely on the basis of the quantifiable benefits, and the decision-maker must be satisfied - and more importantly he may have to satisfy others - that the non-quantifiable

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(1) See: 13, 16, and 36.

Note: The author thanks Mr. Stuper and Professors Gwartney, Mazek, Laird, and Weisbrod for comments.

benefits are great enough to justify the programme(1). The incidence of the cost and benefits of a programme are often different from what one would anticipate. A clear statement of who gains and who loses facilitates the democratic process in that it encourages decision-makers to defend any possible change in the distribution of income attributable to a public project or to indicate the type of lump-sum taxes that will allow injured parties to be reimbursed. The electorate then are likely to be more fully informed when decisions are made after careful consideration, and when the advantages and disadvantages of programmes have been quantified.

After cost-benefit ratios, rates of return, or other investment criterion has been determined, the economists, the planner, etc., may wish to select projects that rank rather low according to this criterion in order to facilitate economic growth or a redistribution of income. If so, they must justify their actions, and, as Burton Weisbrod has suggested, (36) they might provide information concerning the appropriate shadow prices (the rates at which one good is traded for another) between benefits for different groups or between current consumption benefits and economic growth.

For the educator, the cost-benefit analysis in literacy programmes will stimulate research concerning the production function involved. That is: how are inputs in the educational process related to outputs? How, in particular, are they related to marketable outputs now and in the future?

Without any doubt, then, careful cost-benefit analysis, for all its defects, is likely to lead to better decisions than would be possible on the basis of a more casual inspection of projects. Cost-benefit analysis is nothing more than a systematic way of considering alternatives, and it contains all the advantages that are usually related to orderly methods. We can now turn to the more specific task of discussing the costs and benefits of adult literacy programmes. While a discussion of the limitations of market prices and a discussion of the theoretical and empirical problems associated with implementing goals other than those that maximize the value of consumption will be discussed in a later section, we will now be concerned with measuring costs and benefits under the assumption that it is the value of consumption that is to be maximized for a given distribution of income. For the moment, we assume that there are either no redistributional effects associated with adult literacy programmes or that they will be corrected through lump-sum taxes and subsidies. In addition, we will ignore the question of other goals, such as economic self sufficiency.

Benefits associated with adult literacy

Given our goals, the benefits of adult literacy that we wish to measure are clear. To the extent that benefits are final consumer benefits, we wish to measure the total value as reflected by market sales plus the consumer surplus. That is, we wish to measure the willingness to pay for the project's services. To the extent that benefits from adult literacy are intermediate services to be used in the production process, we use the market price of the services as their contribution to the value of consumption.

Perhaps the first benefit from adult literacy that comes to mind is the increased productivity that can be attributed to a worker's ability to read and write. This particular benefit is likely to lend itself to quantification, and

(1) See: 14 and 35.

the value that we would like to discover is the increase in a worker's wage attributable to his being able to read and write. This, of course, assumes that the increase in the wage measures the increase in the value added to the consumption of the society. Even assuming a competitive market, and a programme that is not so large as to change wages and prices in the system, there will be troublesome measurement problems. The major measurement problem will arise because those obtaining primary education of this nature may have other attributes that differentiate them from illiterates, and it may be these other attributes that are responsible for the increased earning ability and not the ability to read and write and, perhaps, do simple arithmetic. Several researchers have attempted to separate the returns to education from the returns to "natural ability", home environment, etc., and, while much work needs to be done in this area, it appears that it is possible and desirable to control for other attributes of the individual when estimating the increased earnings derived from his education(1).

Of course, some of the increased productivity associated with literacy may not be channelled through the market, and a value may have to be imputed for this increase in productivity. For example, a woman caring for children and working in the home is likely to be more productive if she is literate, but, since she is not paid for her services, we have no market value for this benefit. In a later section, we discuss in more detail the use of shadow prices, but here it is sufficient to indicate that market prices for similar services can be used to value the services of the mother and housewife. Burton Weisbrod, for example, (33, pp. 114-119) used this technique to determine the value of a woman's household production. His estimates were used to determine the value of saving a life, but the technique might be readily borrowed for estimating the value of educating a housewife.

Another benefit associated with literate parents is the ability they gain in educating their children. There seems little doubt that the part of the return from a child's education can be attributed to early investments of time and energy made in the home. William Swift and Burton Weisbrod have attempted to make estimates of the intergenerational benefits from education (32, pp. 643-649), but their estimates should be taken as an illustration of estimating the magnitude of such benefits and not as precise calculations.

As economies develop, fewer of the increases in productivity associated with literacy are likely to escape the price calculus of the market in some form. However, in the early stages of economic development a large number of the benefits are not likely to be given market values. The increase in agricultural productivity possible through scientific farming may be, at least, partly attributable to the literacy of the rural population(2). To the extent that large amounts of crops are traded in barter or consumed by the farm family, they will not be given a market value. Imputed prices or shadow prices, then, are likely to be both more important in underdeveloped countries and more difficult to estimate.

Even when we are only considering the private benefits from literacy, we must be careful, as Weisbrod suggests (34, pp. 138-143), not to ignore the value of future options that are available to literate individuals. For example, it is possible for literate individuals to continue their education, either through formal schooling or by on-the-job training. In this case, the benefits from all

(1) See: 2, pp. 79-90., 15, 19.
(2) See: 38.

the education should be compared with all the costs, as suggested by Prest and Turvey (27, pp. 726). Nevertheless, the option benefits should not be ignored, and, from the evidence given in Jacob Mincer's work, (25, pp. 50-79) the value of on-the-job training may increase substantially with increases in education. While Mincer's work was done for the United States, it would be interesting to know what type of relationship exists between formal education and on-the-job training in less developed countries.

Before turning to the question of the benefits from literacy to others in society besides the individual being educated and his family, we should indicate that literacy is likely to have a great value to the individual as a consumer's good. That is, an individual would be willing to buy education even if it did not increase his productivity. To the extent that we ignore the consumption benefits of education and dwell on the economic return to investments in education, we overestimate the cost of the investment.

External benefits (the benefits to others in society in addition to the benefits accruing to the individual from his literacy) are the reason many economists would advocate public provision of education. These external benefits are probably the most important benefits from adult literacy programmes, although the most difficult to evaluate. There are certain types of external benefits that are derived from large numbers of people being literate. For example, the cost of collecting taxes to support government services may be lower for a largely literate population(1). Along these same lines, some of the benefits associated with literacy may exhibit some of the attributes of public goods. In this case, it will be impossible to determine the individual's willingness to pay for the benefits since by the nature of the goods he cannot be excluded from the benefits if he can read(2). Certain types of written information would fall into this category.

External benefits associated with literacy will preclude the efficient allocation of resources in this area if a competitive market is relied upon for allocating resources. The explanation for this is fairly obvious. The allocative efficiency of a market economy is based on the assumption that individuals only consider their own satisfaction when consuming goods. Therefore, we cannot hope for individual utility maximization to be consistent with social utility maximization when goods or services consumed by one individual affect the welfare of others in society. In general, then, a substantial part of primary education is often provided by the State, and, of course, this is why we need cost-benefit analysis to evaluate the provision of the service.

External effects that would be reflected in the educated individual's wage under perfect competition are often mentioned as external benefits, (34, p. 32). The most obvious example of such an external effect is the increase in productivity of fellow-workers due to the literacy of individual members of the work force. There may be a number of reasons for the increase in efficiency of fellow-workers attributable to a comrade's ability to read and write. Workers may have to spend less time in instructing the formerly illiterate in simple machine operations, in correcting his mistakes, etc. In addition, it may simply be impossible to use certain production techniques when some members of the work force are illiterate.

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(1) See: 34, pp. 25-26
(2) See: 28 and 29.

Since these gains should be reflected in the earnings of literate individuals, they need not disrupt ideal markets. It may be, of course, that imperfect capital markets prevent individuals from capturing the benefits from general education, and, therefore, education should be provided publicly.

The preceding discussion has shown clearly that benefits from literacy are rather pervasive, and that the individual, members of his family, fellow-workers society in general, and future generations benefit from an individual being literate. In addition, it has been shown that, with a little immagination, many of the benefits from literacy are measurable. This is not to suggest that all the benefits from literacy have been considered. There are benefits in the form of better health and lower mortality rates to be gained by both society and the individual. Lower mortality rates might statistically be related to literacy and used with wage data to estimate expected gains from reduced mortality rates. Weisbrod's work, Economics of Public Health, would offer useful clues for work in this area (33). At the other end of the continuum, "over populated" countries might consider decreases in the birth rate as a benefit from literacy programmes. Methods for proceeding in this vein are discussed by Bower(1). In fact, the benefits from literacy range from the value of literacy in participatory democracy to the value of improved health and education for future generations. Indeed, the nature of most of these benefits have been suggested elsewhere (5, 16, 13, 30, 34, 35, 38), in discussions of the general benefits of education. The above discussion, then, should be considered as an illustration of the nature of the benefits from adult literacy projects, and means of measuring the benefits.

The cost of adult literacy programmes

Assuming that it is the value of consumption for a given distribution of income we wish to maximize for society, the concept of cost that should be used in evaluating programmes is conceptually clear: we wish to consider the consumption, either present or future, forgone to gain the consumption benefits of a project. If the market is working properly, it will provide us with the information concerning the opportunity costs of many resources used in the project. In equilibrium, the price of any input used in the production process measures the cost of forgone consumption elsewhere in the economy. Therefore, we can use market prices, assuming well-behaving competitive markets, to measure the cost of producing literacy for adult members of the population.

The direct cost of producing adult literacy are much like the costs of producing other types of education. These costs would include the value of teachers' services, the value of books, the value of extra consumption necessary to attend the school, and the value of the capital equipment necessary to provide the education(2)

Most of these values can be determined by the cost of acquiring these inputs in the market. There are certain opportunity costs, however, that may be overlooked because a market price is not paid for the service even though it has a market value. In an adult literacy programme, the most obvious input of this type is the time that the adult must spend in the training programme. To the extent that this is time that the individual would be working, the cost of using this time is the value of the production that he would produce during this time. Under our assumption, the cost would be estimated by multiplying his wage by the amount of time necessary to obtain the education. If the time would

(1) See: 28 and 29.
(2) See: 4, 13, 30.

be taken from leisure activities, we must attempt to value that leisure time. In most cases, the most practical approach to this problem is to measure the value of leisure time at the wage a worker could earn during this time. This is also consistent with the competitive theory that would have the worker's wage measure the marginal rate of substitution between work and leisure. However, this may be an unacceptable assumption in some cases. For example, under certain institutional arrangements, the worker may not be able to substitute work for leisure beyond some point(1).

Perhaps one caution is in order. If there is widespread unemployment in the economy, it may be proper to value the illiterates time at zero, but the teachers may still be a scarce resource that should not be valued at zero. Therefore, unemployment in an economy is not a sufficient condition for valuing all human resources at a zero price.

As with the benefits, we must not ignore costs just because they are not given a market value, or because they are not paid for. Again, using the example of the housewife, we would wish to value the loss in household services and parental care that takes place due to the time spent in the literacy programme. This may be a particularly difficult problem since it may be the quality of the household activity that is reduced. In any case, as in the case of benefits, market values of household services of a given quality and earnings increases of children given good parental care may be crude measures of the values we wish. This example, however, makes the concept of opportunity cost abundantly clear. It is merely the benefits given up to pursue an activity.

The question of determining the cost of an input may also arise when resources are not being withdrawn from the market, but from other government employment - perhaps even other educational activities. If we believe that the prices the government pays for these goods and services represent opportunity costs, then there is no problem. But we may have reason to believe that the pricing system within certain parts of the government is not efficient, or the government may have been given the resources. For example, there may be a number of volunteer workers involved in educational projects. In this case, we can substitute market prices for similar types of work, or we might use linear programming techniques to determine the value of the inputs in other government uses. Recent experience would suggest that the former method is most practical, but programming and input-output techniques do offer some promise in this area(2).

Earlier in this paper, it was suggested that education may have value as a consumption good, and, to the extent that part of the private expenditure on education reflects this value, we overestimate costs if we count this as part of the investment cost. Conversely, there may be real costs involved in getting people to attend school even if they are not forced to endure any of the costs. It may simply be that the psychological cost, for example, of an adult attending a literacy clinic is greater than the private benefit to him from this service. In this case, the social benefits associated with literacy may justify paying the individual to attend school. It may be that the private benefits of literacy are great enough to induce individuals to take part in a programme, but they are not aware of the benefits. Expenditures, then, may be necessary to provide the needed information. These expenditures, of course, should be counted as part of the cost of the programme.

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(1) For a discussion concerning the problem of valuing time see (1).
(2) For a general discussion of linear programming techniques and the development of shadow prices, see (1) above. An example of an attempt to use these techniques in educational planning can be found in (18).

The social rate of discount

Our discussion so far has neglected the crucial question of the proper rate of trade or rate of substitution between present consumption and future consumption. If the perfectly competitive market is relied upon to allocate resources, the market rate of interest is the proper discount rate for comparing future values of consumption with present values. Given the assumption of maximizing net consumption values as suggested earlier, we simply discount future benefits and costs from a project and maximize the difference in their present value. Unfortunately, the matter is not nearly that simple. Even if the market rate of interest was thought to represent the social rate of substitution between present and future consumption, there is not one market rate reflected in the private sector. Interest rates observed in the market reflect various types of risk factors that may not be appropriate for a literacy project. In addition, there may be all sorts of reasons why the private rate of discount would be different from the public rate of discount.

Stephen Marglin in his book, Public Investment Criteria (21, pp. 47-71), suggests that while the private market rate of interest under perfect competition may reflect the balancing between consumers' time preferences for consumption and the marginal productivity of capital, it will not reflect the appropriate social time preference for consumption. A major reason for this is that individuals may collectively exhibit different tastes for present and future consumption patterns than they do privately. Marglin goes on to point out, however, that when other problems like unemployment and growth are introduced there is little hope that the market interest rate is the proper guide to time preference for consumption. While Marglin develops the conceptual framework for determining the proper discount rate under various situations, there is little hope that this will be of aid in empirical cost-benefit work at this stage.

Besides Marglin's work, there have been a number of studies directly concerned with the appropriated discount rate to be used in cost-benefit analysis(1). It would seem, however, that the proper rate of discount depends on some fundamental value judgements by the decision-makers. Unless one is certain, however, that his values have wide support in the population, it would appear that sensitivity analysis offers the best approach in this area. Indeed, Hirsch, (16, 304-305), Weisbrod (35) and others have used this approach in evaluating educational programmes. With this approach, several sets of discount rates are used to gain a present value of future costs and benefits. In many cases, the choice of a discount rate does not appear to make any difference in the final determination of whether the project should be undertaken. However, where the discount rate is crucial in the final choice of a programme like fundamental education, the decision-maker must make a value judgement concerning the proper discount rate, or some sort of consensus must be reached through other methods.

All of the previous discussion has suggested that one discount rate might be used to discount all future benefits and costs. This is certainly not the case. However, most empirical studies use one discount rate for the entire stream of costs and benefits from a programme. While several rates are used for the whole stream of costs and benefits, multiple rates are not used at the same time. This procedure is adopted merely to keep an already difficult area of analysis from becoming unmanageable.

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(1) For two major examples, see (10, p. 99,and 11).

Other investment criteria

Throughout this paper we have suggested that it is the difference between the present value of all costs and benefits associated with a public project like primary education which should be maximized. With this criteria, and a rate of discount, one can determine which projects contributed the most to the value of consumption and which projects should be expanded. The biggest problem with this criteria is selecting the discount rate. However, there are other criteria that have been used and in some cases they will provide the same ordering of projects that would be possible by comparing the difference between the present value of costs and benefits.

One criterion often used in cost-benefit analysis is the internal rate of return. The internal rate of return is that discount rate that would yield a zero present value if all future benefits minus costs were discounted by this rate. The basic idea is that the project is worth while if the internal rate of return is greater than the social rate of discount and that projects might be given priority according to the rank of the internal rate of return under certain conditions. There are several difficulties with this particular criterion. First, there may not be a unique internal rate of return. That is, it is possible that more than one interest rate would reduce the present value of the net returns from an investment to zero. Secondly, we do not avoid the problem of determining a social rate of discount. In fact, if programme benefits are of different durations, the ranking of the programme according to the internal rate of return may be different than the ranking of the present value of benefits minus costs at a given rate of discount(1). Thirdly, there is the implicit assumption in ranking programmes by their internal rate of return that net benefits can be reinvested at the internal rate. While these are the major problems with the concept, a complete discussion of this criterion can be found in Hirshleifer's work on investment criteria, (17).

With all of the above qualifications, however, the internal rate of return is a useful tool in summarizing the relative values of different programmes. In many of the cases involving educational investments, both the present value criterion and the internal rate of return criterion will give the same ranking for all relevant discount rates. Also, it is often the case that multiple solutions for the internal rate of return will contain some solutions that have no economic meaning. For example, Hanoch, in his analysis of earnings and schooling discarded irrelevant solutions such as negative rates of return (12, p. 321).

Since the internal-rate-of-return ranking of projects and the present-value ranking are often the same, the internal rate of return of projects is often found in the literature (3, 7, 12, 13, and 26). It has the advantage of being easy to calculate and easy to present in tables. It has the disadvantage of not giving the reader any idea of the magnitude of the sums involved. Most of the dabate centering around the internal-rate-of-return criterion versus the present-value criterion need not concern the cost-benefit analyst because both values can be computed, given the appropriate benefit and cost data.

Another criterion that is sometimes found in cost-benefit analysis is the recoupment period. In this case, projects are ranked according to how long it will take to recover the original investment. In many cases, this will give different rankings than the present value of net benefits, and it would seem to

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(1) For an example of the phenomenon, see Blaug's work, (3, pp. 343).

have little to recommend it.(1) In general then, projects should be selected on the basis of the difference of the present value of all benefits minus the present value of all costs, or on the basis of equivalent criteria.(2)

Biases in market prices

The discussion to this point has assumed competitive markets and prices reflecting marginal rates of substitution and opportunity costs. An obvious situation where prices would not reflect opportunity costs is in the case of monopoly in the product market. In this case, the market return to an input will be below the marginal social value of that input, and if the government withdraws this input from the private market, the return to the input would understate the cost of using that input in the public sector. The exact opposite case would prevail if an input in the private sector were receiving a subsidy. Arnold Harberger, for example, in his study of returns to human capital and physical capital in India (14, pp. 15-17) had to make an adjustment for subsidies in the labour market.

Another such bias will exist if the markets are competitive, but the amount of resources used by the government programme are great enough to change the equilibrium price. In this case, using the input price prevailing before the government programme to value the inputs used will underestimate the total social cost of those resources, and using the input price after the programme to value the inputs will lead to an overestimate of the social cost of these resources. What we desire, to measure the total social cost of using these resources, is the area under the value of the marginal product curve over the quantity of resources withdrawn. Figure 1 may help to convey the nature of this problem. If w_o is the price paid to a factor before some of that factor is withdrawn from the market for government use, and if w_1 is the price of the factor aft r some of the factor $(0x_o - 0x_1)$ is withdrawn, then, the area acx_ox_1 measures the social cost of using $0x_o - 0x_1$ resources in the public sector. It can be readily seen that the area adx_ox_1 overestimates this loss and the area bcx_ox_1 underestimates this loss. Of course, the smaller the amount of resources withdrawn, the smaller the bias. One might, of course, use some average price to value the resources, and, thereby, approximate the true loss.(3)

As was mentioned earlier, unemployment in the economy will often lead to biased cost estimates of the time of the trainee and the value of the time of the instructors. In addition, benefits from programmes such as those that eliminate illiteracy will be overstated if possible future unemployment is not taken into account. This is often taken into account by assuming some "natural" rate of unemployment in calculating future wage benefits from a programme. Without going into a complete discussion of the theory of unemployment, it is clear that the type of adjustment needed will depend on the particular theory of unemployment that might best describe a particular situation.

On the benefit side, it is obvious that the prices paid for a service plus the consumer surplus would be a misleading guide to the social value of a final consumer good if there were external benefits associated with the consumption of

(1) For an excellent discussion of this decision rule and various other decision rules, see (22, pp. 1-39). For a less rigorous discussion of some common errors in project evaluation, see (23, pp. 139-140).
(2) For a discussion of equivalent criteria see: 27, pp. 703-704.
(3) For a more detailed and rigorous discussion of this problem, see (31).

the good. Of course, we will also underestimate the cost of a resource by valuing it at its market price if there are external costs associated with its production or use. For example, the cost of air pollution does not get reflected in the price of steel. We shall now turn to a discussion of the means of imputing values to inputs and outputs of a programme when market prices are thought to be biased or do not exist.

Shadow prices

Much of the discussion in this section relates to the earlier work concerning shadow prices in cost-benefits analysis by Roland McKean (24). Shadow prices, as was suggested earlier, are nothing more than imputed rates of exchange to be used in cost-benefit analysis when market values do not exist or are biased. One method of determining shadow prices was discussed in some of the earlier examples. This is the method of using market prices for a service provided in the private sector to determine the market value of a service provided publicly. For example, the value to the consumer of literacy might be approximated by the price people pay to obtain this service on a private basis. In this case, of course, the shadow price is inappropriate because it does not include the value of external effects. In literacy programmes, like other programmes, one might be tempted to impute shadow prices from similar programmes in other countries. While such a procedure might be useful as a crude guess, marginal rates of substitution are likely to be vastly different among countries for a whole host of reasons.

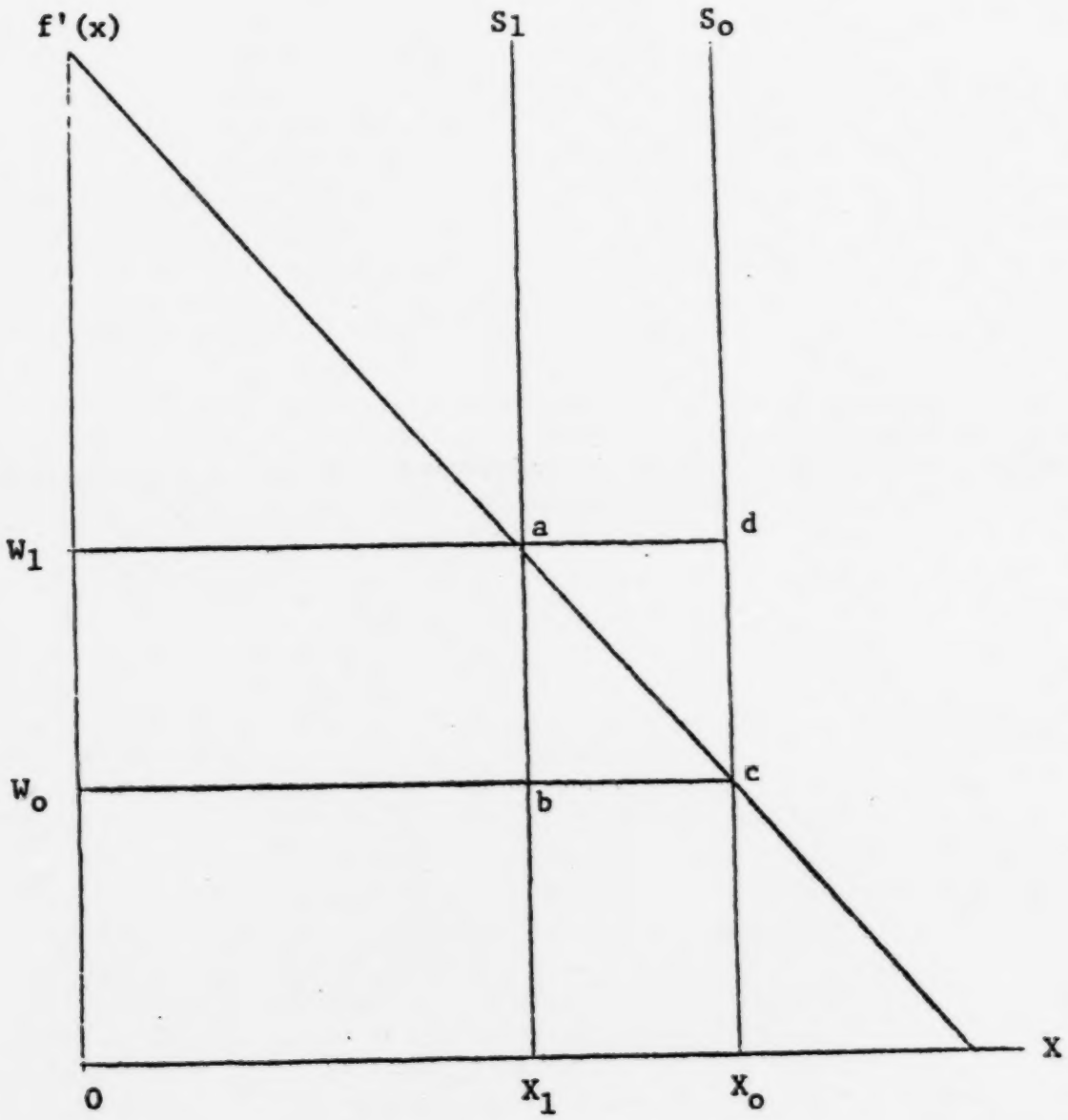
Another method of deriving shadow prices relies on imputing the appropriate trade-off between programmes as reflected in government decisions concerning these programmes. Weisbrod's attempt to measure the marginal rate of substitution between programmes offering different income distribution effects would be a case in point (36).

The obvious difficulty here is that we are trying to deduce one or a few sets of marginal rates of substitution implicit in the decision-makers decisions when these may only represent a few of the actual trades involved. In fact, the rates of exchange that we determine might not even have occurred to the decision-maker. In addition, of course, all this assumes that the government decision-maker reflects the appropriate social welfare function of the society.

The linear programming technique mentioned earlier has some of the same limitations as mentioned above. If we are able to specify the objective function to be maximized, we can gain shadow prices from the dual of a linear programme. For example in my paper, (18), I was able to derive the shadow prices of drop-outs and school-teachers in a public school system. However, even in a developed economy with an abundance of data and technical information available, we are not able to specify the constraints or the objective function well enough to suggest that these techniques can be used in making policy decisions. Nevertheless, we should hope that we will improve our ability to make estimates of all the above types.

We can also obtain shadow prices by adjusting market prices for biases, future changes in demand and supply, eternal effects, etc. In many cases the difficulty is that the adjustment is so arbitrary and crude that it is not clear that it improves our ability to make a rational choice. However, when appropriate adjustments are easily made and clear to the analyst, they should be undertaken.

FIGURE 1



None of the above cautions should be taken to imply that we should not attempt to establish appropriate shadow prices in cost-benefit analysis. The major point is that we should be aware of the limitations of these procedures and we should consider the cost of imputing values to be used in cost-benefit analysis against the value to be derived in the nature of better public decisions. A well-taken point that McKean has made (24) is that the market provides a great deal of information at a very low price, and we might be willing to accept minor biases in these values rather than undertaking expensive adjustments that have only marginal value. However, one should not ignore the value of developing procedures that can be used in other cost-benefit studies.

Other objectives

The previous discussion of cost-benefit analysis in this paper has been based on the assumption that the value of consumption in the society, given a certain distribution of income, is the goal of society. Of course, there may be a number of other goals that society might wish to implement through government projects like literacy clinics. While some of these were alluded to earlier, they warrant a more detailed discussion. Society may wish to use a government programme to help redistribute income among certain racial groups, certain age groups, or regional areas. Or, it may wish to use a programme to stimulate economic growth and guarantee a self-sufficient economy. It may even introduce a programme to help correct its balance of payments problems. In all these cases there is nothing incorrect about introducing these other values. Nor is it necessary that projects be less efficient than other means of meeting some of these goals. For example, literacy programmes may be a much more efficient means of redistributing income, given certain political constraints, than a programme of taxes and subsidies.

Marglin (21) has suggested at least three equivalent means of implementing these other goals. Of course, if the decision-maker can specify the social-welfare, function and the technical-transformation function of producing various desired results, we simply determine that mix of programmes that will equalize the marginal rate of transformation in social welfare with the marginal rate of transformation in production of the various goals. While it is true that the other methods of determining trades between various goals amount to reflecting a social welfare function, they offer a more practical approach to discovering the function than does the option of specifying the welfare function from the start.

The second method of implementing side goals, for instance, the regional distribution of income, is through the use of constraints. For example, we might take as our goal the maximization of net-consumption benefits associated with literacy programmes, subject to the constraint that so many programmes must be developed in a certain region of the country. Such constraints are often used in the development of government programmes, and there is no objection to them if the decision-maker is clear as to what goals he is trying to maximize and if he is using the constraints efficiently. He is being inefficient, if he could provide the desired regional redistribution and still have more consumption benefits from literacy programmes, everything else remaining the same. The difficulty with this approach, as well as the others, is that the decision-maker must be able to consider all other possible means besides the use of literacy programmes of obtaining his goals. This is clearly not practical. However, the decision-maker might suboptimize in each project area and then revise his constraints in different areas as he discovers the advantages of various means of

gaining the desired goals. Of course, all of this ignores the important matter of the means of determining what the goals of society should be. It also reminds us again of the amount of information that the market provides when the goal is to maximize consumption value for a given distribution of income.

The third method of determining the proper programme mix, when there are side goals like the regional redistribution of income, is to specify the proper rate of exchange between costs and benefits among regions. In this case, we have the proper weights to be attached to various costs and benefits, and we can maximize net consumption value using these weights as prices. It was exactly these weights that Weisbrod was attempting to discover in his paper on income redistribution and cost-benefit analysis, (36). The current limits to this approach have already been discussed in the section concerning shadow prices. As we indicated, there is little hope that such values can be discovered and used at this stage of development of the science.

Since all of the previous methods discussed hold little promise of being implemented in current cost-benefit work, it would appear that sensitivity analysis might again play a practical rôle. We might give different weights to the distributional value of certain benefits and see if that changes the decision to undertake a project or not. It may be that even giving rather substantial weight to certain distributional effects will not change the priority ordering of the projects under consideration. Where changes in these weights do make a difference, the decision-maker must choose among the various weights.

Timing of investments

Evaluation of adult literacy programmes should concern itself with a problem that is sometimes overlooked in discussions of investments in education: the timing of the project. However, it should be stated, in all fairness, that this problem has not been ignored by economists in general.(1) The point is that although an investment in literacy does not pay at some particular point in an individual's life or at some particular date in a country's economic development does not mean that it will not be a worth while investment at a later date. For example, adult literacy may have a rather low return for the first few decades while the economy is developing in other areas. However, after that development, it may be that the returns to adult literacy are rather high. When the benefits of a programme have the characteristic of being low in the immediate future, but high later, assuming a constant cost, the present value of net benefits criteria may lead to the rejection of the project at an early date and acceptance later.

While this caution may be most relevant to countries with less developed economies, it is also important in more developed economies. For example, it may be more efficient to retrain workers later in their work career than to attempt to prevent their dropping out of school. In fact, Burton Weisbrod reminded the author that we encourage individuals to drop out of school by providing retraining options at a later date. It may be, then, that adult literacy programmes may have the unintended side effect of encouraging young people not to attend school since they now will have the option of gaining this training later.

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(1) See: 21, pp. 74-79

Rates of return to literacy and primary education

While there has been no work, to the author's knowledge, concerning the costs and returns to adult literacy programmes, there have been a number of studies that have estimated rates of return to primary levels of schooling. The following discussion of some of these studies, and their conclusions, should provide a useful set of examples of how cost-benefit analysis has been actually used. In discussing and interpreting the results of these studies, we will not dwell on those theoretical aspects of the analysis that have already been discussed.

Nalla Gounden, in his recent study of rates of return to education in India, (26), calculated rates of return to levels of education from literacy through college. The earnings data were calculated on the basis of a sample survey of urban income and savings. All conclusions, of course, are rather tentative, given the data limitations. Nevertheless, the findings are interesting and appear to suggest several general policy recommendations.

The following internal rates of return on investments in schooling were reported, (26, p. 352).

Marginal Rates to Increment of Schooling

Literate over illiterate	15.9%
Primary over literate	17.0
Middle over Primary	11.8
Matriculate over Middle	10.2
Bachelor over matriculation	7.0
Engineering degree over matriculate	9.8
Engineering degree over Bachelor	9.7

Average Rates Relative to Illiteracy

Literacy	15.9%
Primary	16.8
Middle	13.7
Matriculate	12.1
Bachelor	8.9
Engineering	9.6

From these, Nalla Gounden makes several reasonable inferences. First, the high relative marginal and average rate of return to literacy and primary education suggest that more of India's education expenditures should be allocated to the lower levels of education. India's particular stage of development seems to be creating great demands and, therefore, high rates of return for the fundamental skills associated with literacy and primary education rather than those associated with high level training. In addition, Nalla Gounden notes that the higher rate of return for primary education over literacy alone implies that dropouts are not economically as productive as competitors.

Using Harberger's estimates of the return to physical capital in India of 17.2 to 26.1 per cent and his own estimates of the returns to investments in education of from 7.0 to 17 per cent, he concludes that India might do better to devote scarce capital funds to physical capital as opposed to education. All these conclusions are based on the direct returns of investments in physical capital and human capital and possible external effects of either type of investment are not estimated. In addition, no possible positive income distribution

effects of one investment versus the other is considered. Of course, one can always assume that the best investment should be taken and income redistributed by taxes and subsidies, but institutional arrangements may not permit this. In any case, the analysis of this data demonstrates the type of information that can be gained from this type of study.

The fact that the return to capital is higher than the return to investment in education is consistent with Harberger's results, (14). This, also, indicates the problem with borrowing results from one country to determine policy in another because these results are opposite to those reached from studies in the United States.

Another study by Carnoy, (7), compares internal rates in various Latin American countries. One interesting finding in Carnoy's paper, (7, p. 362) is that earnings forgone exceed institutional costs as early as the fourth year of primary school, and account for about 60 per cent of the total expenditure on schooling from then through university training. This highlights the importance of taking account of forgone earnings in calculating returns to investments in education. Carnoy finds that private and social rates of return in Mexico, Chile, Colombia and Venezuela are all rather high, and that, in general, these rates are even higher than the high rate of return on physical capital in these countries. The lowest rate of return reported by Carnoy was a 12% rate of return for university training in Chile, and the highest was about 30% for one to six years of schooling in Venezuela.

One interesting conclusion that the author of this study reaches is that bottlenecks occur at the later primary grades and higher levels during periods of rapid economic growth. He cites the high rates of return to primary and university education in Mexico (38% and 23% respectively) and Venezuela (approximately 30% and 23% respectively) relative to secondary rates in those countries (approximately 12% and 14% in Mexico and 17% in Venezuela). These countries were experiencing rather rapid growth during the period. Chile and Colombia with lower growth rates had returns of 24% and 20% respectively for primary education and 12% and 19% respectively for university work. While these conclusions, as the author notes, are rather tenuous on the basis of such "crude" data, they do seem to support this rather interesting hypothesis.

Carnoy concludes that a high rate of investment in education must accompany a high rate of investment in physical capital to generate economic growth. Of course, he notes that here are other benefits from investments in education. In addition, unlike Nalla Gounden's conclusions in India, he suggests that the growth rate might have been even higher in Mexico and Venezuela if there had been greater investments in education.

The above two studies demonstrate how rates of return on investments in education are used to make policy suggestions concerning priorities for investments in different types of education, and priorities between education and physical capital in various countries. A large number of other studies (2, 3, 12, 13, 14, 19) have been done in the United States and elsewhere. Unfortunately the quality of the data is poor for most countries outside the United States and one must take care in interpreting results. Even in the United States, the data could be improved greatly.

While internal rate of return estimates may be equivalent to present value calculations for the two previous studies, they hide the magnitudes of costs and

benefits. Although in many of the studies cited, costs and benefit streams were given, if not present values. Nevertheless, in many studies total costs and benefits are given, and often the question is not directed at rather gross rates of return in education and other capital, but to the evaluation of one specific project. We will look at Burton Weisbrod's work, (35), on preventing high school dropouts as a case in point.

The following is a summary of his estimates of cost and benefits per high school dropout prevented in a St. Louis programme, (35, p. 148). In this case a + indicated an unmeasure quantity that enter positively, a * indicates an unmeasured quantity that enters negatively, and a ** indicates an unmeasured quantity that is not commensurable with the preceding costs and benefits.

Direct Prevention Cost per case		$5,815
Additional Instruction Costs		725
Total Costs		$6,540
Direct Benefits per case		
Increased Present Value of Lifetime Income	$2,750	
Minus Adjustment for Noneducational factors	*	$2,750
Improved Self-Esteem		+
External Benefits		
Increased Productivity of Other Resources		+
Increased Social and Political Consciousness and Participation		+
Decreased Social Costs (e.g. of crime, etc.)		+
Decreased Social Costs of Administering Transfer-Payment Programmes (e.g. of public assistance)		+
Intergenerational Benefits		+
Total Cost not covered by measured benefits		$3,800
Distributional Effects		**

The important fact to be noted in this study is that, given the discount rate of five per cent, the expected measured benefits of the programme are not greater than the expected measured costs. Therefore, while the analysis may help the decision-maker decide whether to undertake the project or not, it is the decision-maker who must determine the weights to be given to the currently unmeasured costs and benefits. The merits of indicating the unmeasured costs and benefits are that the decision can be made as to the value of investing more time and effort to measure the unknown benefits. The cost of gaining the additional information may be so high that it is not worth obtaining. Of course, just knowing the nature of the unmeasured costs and benefits may lead other researchers to find ways to obtain adequate measures.(1)

Summary and conclusions

We have shown that there are a large number of benefits and costs associated with any type of adult literacy programme, and that cost-benefit analysis is a

(1) There are a number of studies that report results in this manner in both evaluations of individual projects and in estimates of broad social benefits. For example see: 15, 16, 18, 25, 30, 33, and 34.

practical way of determining the contribution that the programme might make to the total value of consumption in the society. Indeed, the examples of the use of cost-benefit analysis to evaluate education programmes have shown that important policy recommendations may be made on the basis of the results of cost-benefit analysis. In addition, the example provided by Weisbrod's work on preventing high school dropouts reminds us that the quantifiable costs and benefits may not provide enough information to determine the value of the programme. Incomplete information like the above, and the fact that society may wish to achieve other goals through projects, suggests that cost-benefit analysis will not relieve society's decision-makers of their responsibility of implementing the goals of society. Cost-benefit analysis, however, is a useful tool to the decision-maker in meeting his responsibilities.

It seems clear that adult literacy programmes can be evaluated on the basis of cost-benefit analysis. To the extent that the programmes are not so large as to change market prices, and to the extent that market values provide reasonable estimates of costs and benefits, the evaluation should allow one to have an idea of the contribution of the programme to social welfare. In general, the data needed to evaluate an adult literacy programme can be found in the national census data or can be obtained by sample survey techniques. As we indicated earlier, all this is not likely to allow us to determine the absolute optimal allocation of resources in the society. Nevertheless, cost-benefit analysis in adult literacy programmes should allow us to make more rational choices in the allocation of our expenditures on education.

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